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Two New Species of Trematodes (*Apharyngostrigea bilobata*: Strigeidae, and *Cathaemasia nycticoracis*: Echinostomidae) from Herons, with a Note on the Occurrence of *Clinostomum campanulatum* (Rud.).^{1, 2}

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(Plate I).

During the course of parasite examinations on black-crowned night herons (*Nycticorax nycticorax hoactli* (Gmelin)) and great blue herons (*Ardea herodias herodias* Linn.), originating from three widely separated rookeries in Minnesota, two new species of trematodes belonging to the families Strigeidae and Echinostomidae were collected.

FAMILY STRIGEIDAE.

A number of strigeid flukes collected from both the black-crowned night heron and great blue heron constitute a new species for which the name *Apharyngostrigea bilobata* n. sp. is proposed, the name being suggested by the bilobed character of the ovary.

***Apharyngostrigea bilobata* n. sp.**

Description: Body length 2.8-4 mm., forebody 0.766-1.33 mm. long by 0.633-0.8 mm. wide, hindbody 1.76-2.95 mm. long by 0.266-0.65 mm. wide. Forebody approximately cubic, hindbody cylindrical, narrowing somewhat posteriorly, caudal extremity truncated. Holdfast organ well developed, filling forebody, composed posteriorly of a cup-like structure with anterior half forming a smaller dorsal and a larger ventral lamella. Adhesive gland in posterior extremity of adhesive organ which is at junction of two body regions, strongly lobulated, posterior third composed of a single large piece, anterior two-thirds composed of numerous small lobes, shape longitudinally oval, size 160-266 μ wide by 240-333 μ long. Oral sucker 76-164 μ wide by 124-208 μ long; acetabulum 120-280 μ wide by 132-300 μ long; pharynx absent, oesophagus extends to level of anterior margin of acetabulum, intestinal crura extend along ventral surface of body to its caudal extremity. Testes tandem, multilobated, large, fill third quarter of body length, vasa efferentia unite at anterior margin of first testis forming the voluminous, convoluted proximal portion of vas deferens which narrows greatly in diameter, then passes caudad along median ventral surface of testes and forms large coiled

¹ Paper No. 1734, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul.

² In cooperation with the Division of Game and Fish, Minnesota Conservation Department.

³ Resigned August 15, 1939, to enter the U. S. Bureau of Animal Industry, Zoological Division.

seminal vesicle which fills area between hind testis and genital cone, entering genital pore from dorsal side. Ovary smooth, transversely elongated, bilobed, with deep cleft in posterior margin, located near middle of body; width 180-483 μ , length 124-400 μ ; oviduct originates on posterior-ventral surface of ovary passing dorso-caudad through cleft to dorsal surface of latter where Laurer's canal is given off, then swings to left side of front testis and caudad along its lateral margin to Mehlis' gland. Ascending limb of uterus extends cephalad from Mehlis' gland along ventral side of anterior testis and ovary, rising to dorsal side of body at anterior margin of ovary and continuing cephalad to near holdfast gland where it bends caudad to form descending limb which passes along ventral side of body to genital cone, entering common genital duct from ventral side. Mehlis' gland lies between testes, dextrad from median line. Yolk reservoir median, at caudal margin of Mehlis' gland. Vitelline follicles large, spread over entire surface of body and lips of holdfast except dorsal to holdfast gland and reproductive organs and in ventral surface of forebody. Follicles fewer laterally in region of ovary and testes, more abundant ventrally and laterally between holdfast gland and ovary; they encircle body caudad from hind testis. Ova 56-64 μ wide by 83-88 μ long.

Host: Nycticorax nycticorax hoactli (Gmelin).

Ardea herodias herodias Linn.

Habitat: Small intestine.

Locality: Owatonna, Minnesota, U. S. A.

Type Specimen: U. S. Nat. Mus. Helm. Coll. No. 9279; paratype: 9280; also Helm. Coll. Div. Ent. and Eco. Zool., University of Minnesota.

DISCUSSION.

The genus *Apharyngostrigea* was erected by Ciurea (1927) to receive *Distoma cornu* Goeze (Zeder) 1800. Szidat (1929) added *A. brasiliiana* Szidat, 1929, and *Distomum simplex* Johnston, 1904. In his description of *D. simplex*, Johnston (1904: 112) states "the oral and ventral suckers are large and equal in size . . .; the pharynx is smaller" but since his figures do not show a pharynx Szidat concluded that "Trotz dieser Bemerkung scheint auch bei dieser Art der Pharynx ganz zu fehlen, da Johnston 1904 ihn in seinen Figuren nicht abbildet." The correctness of Szidat's conclusion in regard to the absence of the pharynx on the grounds that it is not figured might justly be questioned and until an examination of Johnston's material has been made, *Distomum simplex* should be considered as a provisional member of the genus. Dubois (1938) included *Holostomum repens* Chase, 1921, from herons.

Subsequent to the appearance of Szidat's paper, the descriptions of four additional species of *Apharyngostrigea* have appeared. These, together with *Apharyngostrigea bilobata* n. sp., are included in the following key, which will serve to differentiate them. *A. bilobata* may be readily distinguished from all the known species by the strongly bilobated ovary with its deep posterior cleft.

KEY TO THE KNOWN SPECIES OF *Apharyngostrigea*.

1. Testes with margins smooth or nearly smooth, rounded or ovoid 2
 Testes with margins deeply lobated, variously shaped 3
2. Testes very large, being 800 μ in diameter; oral sucker large, being 740 μ in diameter; from *Cancroma cochlearia*, Brazil *A. brasiliiana* Szidat, 1929
 Testes small, being 336-400 μ and 330-338 μ in diameter; oral sucker 180 μ in diameter; from cattle egret, India *A. egretti* Verma, 1936

3. Testes bilobated, horse-shoe shaped; anterior limit of vitellaria at level of acetabulum, ovary and testes in posterior half of hindbody; from *Circus macrurus*, Syria..... *A. flexilis* Dubois, 1934
 Testes multilobated, not horse-shoe shaped; ovary at middle of hindbody or cephalad 4
4. Oral sucker and acetabulum equal or about equal in size, ratio being as 1:1 - 1:1.1..... 5
 Acetabulum distinctly larger than oral sucker..... 6
5. Ovary near middle of hindbody, walls of hindbody nearly parallel, not bulged by testes; oral sucker and acetabulum equal in size; from *Notophox novae hollandiae*, Australia..... *A. (?) simplex* (Johnston, 1904)
 Ovary in posterior portion of first quarter of hindbody; testes enormous in size with numerous lobes, causing hindbody to bulge greatly in two middle quarters; oral sucker slightly smaller than acetabulum, ratio as 1:1.1; from *Herodias timorensis*, Philippine Islands.....
A. garciai Tubangui, 1933
6. Ovary bilobated, being deeply cleft on posterior margin; from *Nycticorax nycticorax hoactli* and *Ardea herodias herodias*, North America.....
A. bilobata n. sp.
 Ovary not bilobated 7
7. Vitellaria do not reach to acetabulum; body large, being 6 mm. long; from *Notophox novae hollandiae*..... *A. repens* (Chase, 1921)
 Vitellaria extend cephalad from acetabulum..... 8
8. Acetabulum about twice size of oral sucker; body large, being 6 mm. or more in length; from *Ardea cinerea* and *A. purpurea*, Europe.....
A. cornu Goeze (Zeder), 1800
 Acetabulum not twice as large as oral sucker, ratio as 1:1.5; body small, up to 3.5 mm. long; from *Ardeola ibis ibis*, Egypt..... *A. ibis* Azim, 1935

FAMILY ECHINOSTOMIDAE.

Two specimens of flukes collected from one black-crowned night heron belong to the genus *Cathaemasia* Looss, 1899. The name *Cathaemasia nycticoracis* n. sp. is proposed.

***Cathaemasia nycticoracis* n. sp.**

Description: Body elongated with ends rounded, anterior end somewhat attenuated cephalad from acetabulum; length of body 5.3-5.4 mm., width at level of ovary 1.05-1.06 mm. Cuticle without spines. Oral sucker subterminal, 416 μ wide by 416-466 μ long. Acetabulum 700 μ wide by 633-650 μ long, located in anterior part of second quarter of body length. Prepharynx absent, pharynx 208-216 μ wide by 266-292 μ long; oesophagus 466 μ long, of uneven diameter, being strongly constricted in some parts while others are greatly distended, lined with intestinal epithelium; intestinal caeca extend to caudal end of body, with small evaginations of wall. Testes and ovary in third quarter of body length. Testes small, tandem, about equal in size, compact and with 6-9 short dendritic processes each, anterior testis 450 μ wide by 366-433 μ long, posterior testis 416-450 μ wide by 416-483 μ long. Cirrus retracted, seminal vesicle about 400 μ long by 128 μ in diameter. Genital pore median, at anterior margin of acetabulum. Ovary transversely elongated, separated from anterior testis by Mehlis' gland and seminal receptacle, 300-433 μ wide by 166-200 μ long; seminal receptacle oval, 216 μ wide by 150 μ long, located at posterior margin of ovary; Mehlis' gland at level of

and sinistrad from seminal receptacle; uterus short, its coils lie between ovary and acetabulum. Laurer's canal present. Vitellaria consisting of rather large follicles, extending from between caudal margin of acetabulum and ovary to posterior end of body. Caudad from hind testis, the follicles meet medially. Excretory vesicle with shallow, lateral evaginations. Ova 91-95 μ long by 42-53 μ wide.

Host: Nycticorax nycticorax hoactli (Gmelin), *Ardea herodias herodias* Linn.

Habitat: Small intestine.

Locality: Owatonna, Steele Co., Minnesota; Cheboygan County, Michigan (Michigan Biological Station).

Type Specimen: No. 9281 U. S. Nat. Mus. Helm. Coll.; paratype: Helm. Coll. Ent. and Eco. Zool., University of Minnesota, No. 4:14.

DISCUSSION.

In his discussion of the genus, Harwood (1936) pointed out the similarities existing between *Cathaemasia* Looss, 1899, and members of the family Echinostomidae in the nature of the excretory system and the presence of an epithelial rather than a cuticular lining of the oesophagus. For this reason, he transferred it from the family Cathaemasiidae Furhmann, 1928, back to the family Echinostomidae where Odhner (1926) had placed it originally. *Cathaemasia* together with *Mehlisia* Johnston, 1913, and *Stephanoproroides* Price, 1934, lack the spined collar of the other members of the family Echinostomidae.

Cathaemasia nycticoracis differs from all the known species of the genus in (1) the absence of cuticular scales, (2) in the very compact nature of the body of the testes, both of which are confined to the third quarter of the body length, and from which radiate simple, stubby branches, (3) the equatorial position of the ovary, and (4) the vitellaria fuse medially caudad from the hind testis. It resembles *C. reticulata* (Wright, 1879) in that the uterus is relatively short.

The following key, adopted from Harwood (1936), will further differentiate the species.

KEY TO THE SPECIES OF *Cathaemasia*.

1. Body without scales; ovary equatorial; testes with very short, simple branches radiating from large compact body, confined to third quarter of body length; vitelline follicles fuse medially caudad from hind testis; from *Nycticorax nycticorax hoactli* and *Ardea herodias herodias*, North America..... *C. nycticoracis* n. sp.
Body scaled; ovary definitely pre- or postequatorial; testes consist primarily of long slender branches; extend into extreme posterior part of body 2
2. Ovary preequatorial; uterus relatively short; cuticular spines present on both ventral and dorsal surfaces, from *Megaceryle alcyon*, North America.
C. reticulata (Wright, 1879)
Ovary postequatorial; uterus relatively long; cuticular spines confined to ventral surface. 3
3. Testicular branches relatively short; vas efferens from caudal testis passing to right; from *Ardea nigra*, Europe, and *Ciconia alba*, Africa....
C. hians (Rud., 1809)
Testicular branches relatively long; vas efferens from caudal testis passing to left..... 4

4. Egg 160-170 μ long; from *Leptoptilus crumenifer*, Africa.....
C. spectabilis Odhner, 1926
 Egg 57-62 μ long; from *Tantalus ibis*, Africa...*C. famelica* Odhner, 1926

NOTE ON THE OCCURRENCE OF *Clinostomum campanulatum*
 IN HERONS AND CORMORANTS.

The black-crowned night herons, totalling 49 altogether, consisted of both adult and juvenal birds taken during the course of several summers from rookeries in Ramsey and Steele Counties, Minnesota. The great blue herons, on the other hand, were much fewer, there being only 11 birds, originating from a rookery in Rice County. From the total of 60 herons examined, *Clinostomum campanulatum* occurred only four times, all of which were in the black-crowned night herons.

In addition to the herons, *Clinostomum campanulatum* was found in 6 of 18 double-crested cormorants, *Phalacrocorax auritus auritus* (Lesson) killed in Minnesota. This appears to be a new host record for *C. campanulatum*.

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EXPLANATION OF THE PLATE.

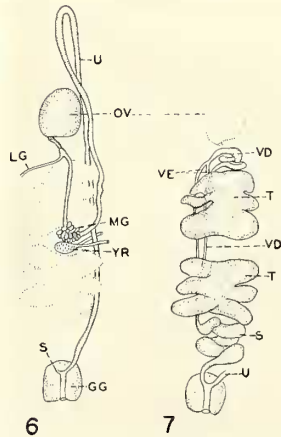
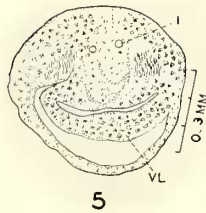
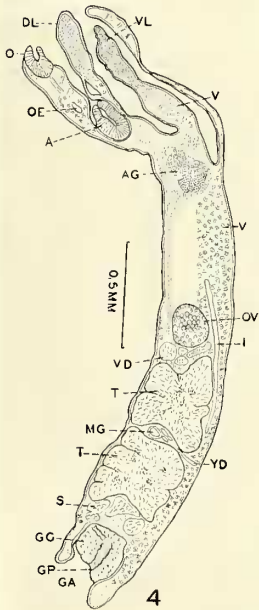
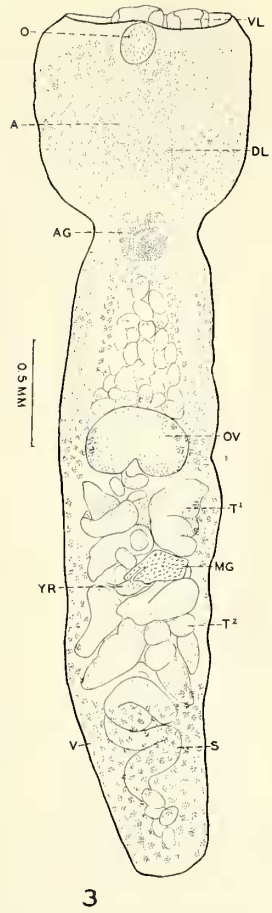
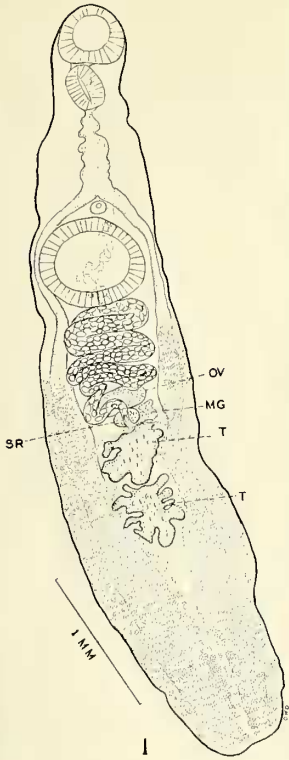
All drawings made with the aid of a camera lucida except Figs. 6 and 7, which were made free-hand.

PLATE I.

- Fig. 1. Ventral view of *Cathaemasia nycticoracis*.
 Fig. 2. Dorsal view of *Apharyngostrigea bilobata* from *Ardea herodias herodias*.
 Fig. 3. Dorsal view of *A. bilobata* from *Nycticorax nycticorax hoactli*.
 Fig. 4. Longitudinal section of *A. bilobata*.
 Fig. 5. Cross-section of *A. bilobata* taken a short distance cephalad from adhesive gland.
 Fig. 6. Sinistral view of female reproductive system. Reconstructed.
 Fig. 7. Sinistral view of male reproductive system. Reconstructed.

Key to Abbreviations.

A. acetabulum	OV. ovary
AG. adhesive gland	S. seminal vesicle
DL. dorsal lip	SR. seminal receptacle
GA. genital atrium	T. testes
GC. genital cone	U. uterus
GP. genital pore	V. vitellaria
I. intestinal caeca	VE. vas efferentia
LC. Laurer's canal	VD. vas deferens
MG. Mehlis' gland	VL. ventral lip
O. oral sucker	YD. yolk duct
OE. oesophagus	YR. yolk reservoir



TWO NEW SPECIES OF TREMATODES (APHARYNGOSTRIGEA BILOBATA : STRIGEIDAE, AND CATHAEMASIA NYCTICORACIS : ECHINOSTOMIDAE) FROM HERONS, WITH A NOTE ON THE OCCURRENCE OF CLINOSTOMUM CAMPANULATUM (RUD.).